

5 **COMMUNICATIONS ACCESSORY AND COMPUTING UNIT
 THAT OPERATES THEREWITH**

10 **BACKGROUND OF THE INVENTION**

15 The invention relates generally to computing units and, more particularly, to
 communications devices that operate with computing units.

20 Computing units, such as desktop, laptop, and handheld computers, typically
 communicate with peer computing and peripheral devices by way of a wireline
 communication interface. Typical protocols that bring about communication between
 peer and peripheral computing units include the Universal Serial Bus (USB), the
 Peripheral Component Interconnect (PCI) protocols, and many others. However, with
 the advent of wireless computer communications, such as wireless local area networks,
 Bluetooth, and IEEE 802.11 protocols, computing units can move away from wireline
 communications media and communicate wirelessly.

25 Wireless computer communications can be realized by using a wireless
 communications module that couples to a Personal Computer Memory Card
 International Association (PCMCIA) interface port available on many types of
30 computing units. When a PCMCIA module is used, a radiating and receiving structure
 protrudes horizontally from the base of the computing unit and must be physically
 detached from the computing unit prior to storing the device in a carrying case. If the
 module is allowed to protrude from the PCMCIA slot as the computing unit is placed
 into a computer case, damage to the communications module and the surrounding
 structure can result. Additionally, when the computing unit is brought into an
 environment where the communications module should not inadvertently radiate energy,
 such as aboard an airplane, the communications module must be physically detached
 from the computing unit.

Ad hoc wireless computer communications can be brought about by using a transceiver that dangles from an end of a USB-compliant or a PCI-compliant cable. However, although this can enable a computing unit to quickly become capable of wireless communications, neither this nor the previously discussed PCMCIA device
5 provide a communications device that appears physically integrated into the structure of the computing unit. Further, both devices are required to be disconnected from the computing unit to ensure that the device does not inadvertently radiate.

Therefore, it is highly desirable for a communications accessory to appear
10 physically integrated into the structure of the computing unit, while providing control over the activation and deactivation of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an illustration of a computing unit that includes a communications
15 accessory in accordance with a preferred embodiment of the invention;

Figures 2A and 2B are views of the communications accessory of Figure 1 in the compressed and extended positions in accordance with a preferred embodiment of the invention;

Figure 3 is a cutaway view of the upper right portion of the display of Figure 1
20 showing the channel that accepts the communications accessory, in accordance with a preferred embodiment of the invention;

Figure 4 is a cutaway view of the upper right portion of the display of Figure 1 showing the communications accessory in accordance with a preferred embodiment of the invention;

Figure 5 is another detailed view of a portion of the display of Figure 2 showing
25 the communications accessory in accordance with a preferred embodiment of the invention;

Figures 6A and 6B are cutaway views of a portion of the computing unit of
Figure 1, in accordance with an alternate embodiment of the invention;

Figure 7 is a cutaway view of the communications accessory of Figure 2 in
30 accordance with a preferred embodiment of the invention;

Figure 8 is a block diagram of components within the communications accessory of Figure 7 in accordance with a preferred embodiment of the invention;

Figure 9 is a block diagram of elements of a communications accessory in accordance with an alternate embodiment of the invention;

5 Figure 10 is a block diagram of components of a communications accessory in accordance with an alternate embodiment of the invention;

Figure 11 is a block diagram of components of a communications accessory that includes a camera in accordance with an alternate embodiment of the invention; and

10 Figure 12 is a flowchart for a method of transmitting information received from a computing unit in accordance with a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 Figure 1 is an illustration of a computing unit that includes a communications accessory in accordance with a preferred embodiment of the invention. In Figure 1, computing unit 10 includes keyboard 15, display 30, and communications accessory 20. Computing unit 10 performs tasks that may include: word processing, spread sheet analysis, electronic mail, and Internet browsing.

20 In Figure 1, communications accessory 20 is positioned on the upper right surface of display 30 of computing unit 10. This location may be selected due to its elevation above a large portion of computing unit 10, thereby providing line-of-sight communications with other peer or peripheral computing units nearby computing unit 10. The accessory can also be placed at other locations of computing unit such as, near the upper center portion of display 30, or near the upper left corner of display 30, or any
25 other location on computing unit 10 according to the preferences of the particular application.

30 In Figure 1, communications accessory 20 provides the computing unit with a radio frequency wireless communications capability. Thus, communications accessory 20 enables computing unit 10 to communicate with other computing units by way of transmitting or receiving signals that accord with a wireless protocol, such as Bluetooth and IEEE 802.11B.

In another embodiment, communications accessory 20 provides an infrared communications link that enables computing unit 10 to communicate with other computing units by way of infrared signals. Further, communications accessory 20 can be a small display that employs an optical means to project images onto an external surface so that these images may be viewed by the human eye. Communications accessory 20 can also present images to the eye directly and without an intervening external surface.

Figures 2A and 2B are views of the communications accessory of Figure 1 in the compressed and extended positions in accordance with a preferred embodiment of the invention. Preferably, communications accessory 20 includes a top section 22, bottom section 24, and receptacle 26. In Figure 2A, an inner surface of top portion 22 slides along an upper portion of bottom section 24 to a compressed position such as that shown in Figure 2B.

Communications accessory 20 includes a resilient element, such as a spring (see Figure 7) that biases top section 22 in an extended position. Communications accessory 20 preferably also includes a latch (see Figure 7) that hinders the extension of the accessory from the compressed position until the accessory is actuated. Desirably the accessory is able to radiate or receive signals while in the extended position, as in Figure 2A, and unable to radiate or receive while in the compressed position, as in Figure 2B.

Figure 3 is a cutaway view of a portion of an upper right portion of display 30 of computing unit 10 showing channel 25 accepting the communications accessory in accordance with a preferred embodiment of the invention. Preferably, the base portion of channel 25 includes connector 27 that provides a mechanical and electrical interface to computing unit 10 by way of a standard such as USB, PCI, Secure Digital, or Memory Stick. Connector 27 preferably also provides direct current, alternating current, or another type of electrical power to the accessory.

Figure 4 is a cutaway view of the upper right portion of display 30 showing communications accessory 20 in accordance with a preferred embodiment of the invention. In Figure 4, a user's finger (50) is shown inserting communications accessory 20 into channel 25 of a portion of computing unit 10 and applying downward pressure to physically latch and store the accessory in the compressed position. Desirably, the compressible aspect of the communications accessory enables the accessory to be stored

within the outer boundary of display 30. When communications accessory 20 is stored within display 30, the accessory is partially or fully deactivated. This partial or complete deactivation of the accessory can be facilitated by way of a mechanical switch inside the accessory, or by way of a mechanical switch within the display at an area
5 beneath the accessory. Further, the partial or complete deactivation of communications accessory 20 can be brought about by way of a change in a logic state of driver that controls the interaction between the accessory and the computing unit.

Figure 5 is another detailed view of a portion of the display of computing unit 10 showing communications accessory 20 in accordance with a preferred embodiment of the invention. In Figure 5, a user's finger (50) is shown applying downward pressure to the accessory 20, thereby unlatching the accessory and allowing it to be extended from its compressed position. Preferably, when communications accessory 20 is extended to protrude beyond the boundary of the computing unit, the accessory is activated. This activation permits wireless communications with other computing units by way of
10 communications accessory 20.

Figures 6A and 6B are cutaway views of a portion of the computing unit showing an alternate embodiment of the communications accessory. In Figures 6A and 6B, an outer surface of communications accessory 70 is fabricated using a single section, with a lower portion of the single section sliding along an outward surface of
15 base 77. Base 77 remains affixed to a portion of computing unit 10 and incorporates a resilient mechanism that enables the activation and deactivation of the accessory as a result of the compression and extension of the accessory. Figure 6A shows the accessory in the compressed position corresponding to the partial or complete deactivation of the accessory. Figure 6B shows the accessory in the extended position
20 corresponding to the activation of the accessory.

Figure 7 is a cutaway view of communications accessory 20 in accordance with a preferred embodiment of the invention. In Figure 7, aperture 220 is a spiral antenna coupled to coaxial cable 260. Resilient element 230 provides tension that separates the sections of coaxial cable 260 when latch 280 retains the accessory in the compressed
30 position. When communications accessory 20 is extended, the sections of coaxial cable 260 are brought together, thereby coupling aperture 220 to up-converter 240. Up-

converter 240 converts signals of a first format to a second format so that signals of the second format can be radiated by aperture 220.

Preferably, the accessory is maintained in the extended position by way of resilient element 230. When the accessory is extended, a voltage is supplied by coaxial cable 260 to illuminate lamp 235, thus indicating that the accessory has been activated. Lamp 235 can be a light-emitting diode or other electronic device that emits light or other radiation when a voltage is applied.

Aperture 220 can also be an omnidirectional antenna having a balun and a coaxially coupled feed structure. Alternatively, aperture 220 can represent a directional antenna that provides increased gain in certain directions and decreased gain in other directions. Regardless of the type of antenna represented by aperture 220, resilient element 230 influences the coupling of the antenna to up-converter 240, thus permitting aperture 220 to radiate or receive signals.

In accordance with an alternate embodiment of the invention, aperture 220 can be replaced by an aperture that receives and transmits infrared energy, thus providing an infrared communications capability. Aperture 220 can also be a camera lens or other optical device that receives images. Further, aperture 220 can be a miniature projector that projects images onto an external surface or makes images available to the human eye directly.

Resilient element 230 can be a spring or other elastic material. The selected resilient or elastic element can be placed between an upper section of coaxial cable 260 and aperture 220, or placed between a lower section of the coaxial cable and up-converter 240. Preferably, resilient element 230 is placed between any two or more elements to provide a mechanism for partially or completely deactivating the accessory in response to the compression or extension of the accessory. As mentioned in reference to Figure 4, the partial or complete deactivation of the accessory can be accomplished by positioning a resilient element beneath the accessory, such as within display 30. This deactivation can also be brought about by a software-implemented change in the logical state of a driver program that runs on a processor of computing unit 10 to control the operations of the accessory.

Figure 8 is a block diagram of components within the communications accessory of Figure 7 in accordance with a preferred embodiment of the invention. In Figure 8,

receptacle 258 provides a mechanical interface to a portion of computing unit 10, thereby enabling power supply 260 to receive power input 250. Receptacle 258 also conveys baseband signals from the computing unit to up-converter 240 by way of up-converter input 252. Up-converter input 252 represents signals encoded in a first
5 format, such as baseband digital, video, phase modulated, or other type of signal from computing unit 10 of Figure 1. These signals are converted to a second format that accords with a protocol such as Bluetooth, or IEEE 802.11B. After the conversion, the signals are transmitted to an external computing unit through aperture 220. The coupling of signals from up-converter 240 to aperture 220 is controlled or influenced by
10 resilient element 230.

Figure 9 is a block diagram of elements of a communications accessory in accordance with an alternate embodiment of the invention. The operation of communications accessory 120 has some similarity with the operations of communications accessory 20, an exception being that accessory 120 transmits signal
15 through a wireless infrared link as opposed to the wireless radio frequency link of communications accessory 20. Communications accessory 120 can be similar in appearance to communications accessory 20.

In Figure 9, aperture 320 includes a window through which infrared signals are transmitted. Infrared modulator 330 is coupled to aperture 320. Desirably, infrared
20 modulator 330 generates and regulates the flow of infrared signals from converter 340 to aperture 320 in accordance with an infrared communications protocol.

Communications accessory 120 receives input 352 by way of receptacle 358, which carries baseband information from a computing unit. The baseband information can be binary digital information, video pluses, or any other type of signal that conveys
25 information to the accessory. Communications accessory 120 also includes power supply 360, which provides primary power to infrared modulator 330 and converter 340. Resilient element 355 influences the coupling of primary power to power supply 360 as a result of the accessory being in a compressed or an extended position. When communications accessory 120 is in the compressed position, resilient element 355
30 decouples input 350 from power supply 360, thereby removing primary power to the accessory. When communications accessory 120 is in the extended position, resilient element 355 couples power supply 360 to input 350 from receptacle 358.

Figure 10 is a block diagram of components of a communications accessory in accordance with an alternate embodiment of the invention. In Figure 10, communications accessory 420 operates in a manner somewhat similar to communications accessory 20, an exception being that accessory 420 projects optical
5 information onto an external surface, as opposed to the radio frequency wireless link of communications accessory 20. Accessory 420 can be similar in appearance to communications accessory 20 of Figure 2.

Communications accessory 420 receives input 452 by way of receptacle 458. Preferably, input 452 includes baseband information from a computing unit. This
10 information can be in the form of binary digital data, video pulses, or any alternative form that conveys information to communications accessory 420. Power supply 460 provides primary power to projector 435 and to converter 440. Resilient element 455 influences coupling of the primary power to power supply 460 as a result of the accessory being placed in a compressed or an extended position. When the accessory is
15 in the compressed position, resilient element 455 decouples power supply 460 from the computing unit. When communications accessory 420 is in the extended position, resilient element 455 brings power supply 460 into contact with receptacle 458 that carries power from the computing unit.

In the embodiments of Figures 1-10, the communications accessories (20, 120,
20 and 420) have been described as being transmitters in order to simplify the description. However, the up-converters and infrared modulators of Figures 5, 6, and 7 can be replaced by two-way transceivers that both receive and transmit information. This can be realized by way of a separate transmit and receive path between apertures 220, 320, and 430, and receptacles 258, 358, and 458, respectively. Or, these functions can be
25 performed using converters and modulators that function as transceivers that facilitate two-way transmission and reception of signals.

Figure 11 is a block diagram of components of a communications accessory that includes a camera in accordance with an alternate embodiment of the invention. In Figure 11, communications accessory 520 operates in a manner that is at least somewhat
30 reciprocal to communications accessory 420 of Figure 10. In Figure 11, communications accessory 520 receives optical information as opposed to transmitting

optical information as performed by communications accessory 420. Communications accessory 520 may be similar in appearance to communications accessory 20 of Figure 2.

Communications accessory 520 receives optical images through aperture 530.

- 5 The images are converted, by way of converter 535, from an optical format to an electronic format. Preferably, the electronic format is in accordance with a protocol such as USB, PCI, Secure Digital, or Memory Stick. These signals output through receptacle 558 to a computing unit. Receptacle 558 desirably also conveys power from the computing unit.

- 10 Converter 535 can be any type of image capturing device such as a digital camera. Desirably, converter 535 focuses incoming light through a lens that permits the light to strike a sensor array. In this embodiment, the converter converts the incoming light to an electronic format.

- 15 Resilient element 550 influences the coupling of primary power to power supply 560 as a result of the accessory being placed in a compressed or an extended position. When communications accessory 520 is in the compressed position, resilient element 550 decouples power supply 560 from the computing unit. When communications accessory 520 is in the extended position, resilient element 550 brings power supply 560 into contact with power connections from the computing unit.

- 20 In alternative embodiments, resilient element 550 is placed between other elements of communications accessory 520. For example, resilient element 550 can influence the coupling and decoupling of power supply 560 while the connection of converter 535 to receptacle 558 is not significantly affected by the compression and extension of the accessory. In another embodiment, resilient element 550 directly
25 influences the coupling of signals from aperture 530 as a result of the compression or extension of communications accessory 520.

- Figure 12 is a flowchart for a method of transmitting information received from a computing unit in accordance with a preferred embodiment of the invention. The method begins at block 600 where the accessory is extended from a channel formed in
30 the case of a computing unit. Block 600 can further include extending a spring or other resilient element that permits the accessory to accept data from the computing unit coupled to the communications accessory. Alternatively, block 600 can include the

computing unit activating a logical address corresponding to the communications accessory, thereby enabling communications between the accessory and the computing unit. Block 600 can optionally include latching the communications accessory in an extended position. This latching action can permit power to couple from the computing unit to the accessory.

The method continues at block 610 in which the communications accessory receives information in a first format, such as USB, PCI, Secure Digital, or Memory Stick. The method continues at block 620 in which the information is converted to a second format. This second format can correspond to a Bluetooth protocol, or an IEEE 802.11B protocol. The second format can also correspond to an optical or infrared protocol. The method continues at step 630, in which the communications accessory transmits information using the second format.

Block 630 may include transmitting a signal through an antenna. Alternatively, block 630 may include modulating and transmitting an infrared signal using second format, as described with reference to Figure 9. Further, block 630 can include transmitting optical information which can be viewed on an external surface by a human eye, as described with reference to Figure 10.

What is claimed is: